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Examiner: R.F. DEAN; Art Unit: 2684; Docket No.: 1587

In RE: **Application of Frank KOWALEWSKI**

Ser. No.: **09/830,540**

Filing Date: **April 26, 2001**

January 5, 2006

AMENDED APPEAL BRIEF

Hon. Commissioner of Patents
and Trademarks,
Washington, D.C. 20231

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
On 1/5/06

Sir:

In response to the final Office Action dated January 26, 2005, the advisory action dated May 18, 2005 and the Notice of a Non-Compliant Appeal Brief dated December 15, 2005, please consider the following arguments for overturning rejections of the pending claims of the above-identified U.S. Patent Application:

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I. REAL PARTY IN INTEREST

The real party in interest is ROBERT BOSCH GmbH, owner of 100 % of the above-identified U.S. Patent Application.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences.

III. STATUS OF CLAIMS

1. Claims 1 to 28 were canceled; claims 29 to 45 are pending.

2. Claims 29 to 30, 39 to 40 and 45 stand rejected under 35 U.S.C. 102 (e) as anticipated by Antonio, et al, U. S. Patent 6,519,456 B2.

3. Claims 31 to 32, 35 and 42 stand rejected under 35 U.S.C. 103 (a) as obvious over Antonio, et al, U.S. Patent 6,519,456 B2, in view of Karlsson, et al, U.S. Patent 6,167,039.

4. Claims 33 to 34, 36 to 38 and 43 to 44 stand rejected under 35 U.S.C. 103 (a) as obvious over Antonio, et al, U.S. Patent 6,519,456 B2, in view of Karlsson, et al, U.S. Patent 6,167,039, and further in view of Zhuang, et al (Vehicular Technology Conference, 1995 IEEE 45th Volume: 1, 25 to 28, July 1995 Pages: 206 to 210, Vol. 1).

5. Claim 41 stands rejected as obvious over Antonio, et al, U.S. Patent 6,519,456 B2, in view of Zhuang, et al (Vehicular Technology Conference, 1995 IEEE 45th Volume: 1, 25 to 28, July 1995 Pages: 206 to 210, Vol. 1).

IV. STATUS OF AMENDMENTS

1. A request for reconsideration was filed April 26, 2005, but the request for reconsideration included no proposed changes in the claims and consisted entirely of argumentation.

2. The advisory action dated May 18, 2005 indicated that the request for reconsideration was entered and included a brief response to the argumentation in the request for reconsideration for each rejection individually.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Note that drawing figure reference numbers are found in the text of this summary in parentheses.

1. Method Claims 31 to 36

None of the elements of the claimed method recited in independent method claim 31 or any of the dependent method claims 32 to 36 are in "step for form" and thus none of these claims contain "step plus function" elements, which must be interpreted in accordance with 35 U.S.C. 112, sixth paragraph.

In general, the claimed method of the invention is characterized by transmission of pre-equalized signals from a transmitter or base station (1) over a plurality of radio channels (20, 25) to a second or mobile radio station (2), which reduces fading or amplitude fluctuations that can occur in a multi-way transmission channel in connection with other features of the invention. Instead in prior art systems it is common to transmit data over a single channel or frequency band to multiple receivers, but to encode the transmitted signals differently for different receivers.

A. Claim 31

The subject matter regarding plural radio channels is included in method claim 31, in the preamble and steps a) and b), and is supported by the disclosures on page 1, line 14, to page 2, line 2, of the appellant's originally filed specification. This aspect of the method claimed in claim 31 is described in more detail particularly on page 5, line 23, to page 6, line 14.

In the method claimed in claim 31 the multi-channel transmission takes place from a single antenna (50) of the first radio station (1) to plural antennas (60, 65) of the second or mobile radio station (2), as disclosed on page 6, lines 11 to 14, of the appellant's specification and as explained in connection with Fig. 2.

According to step a) of the method claimed in claim 31 radio signals are pre-equalized in a single modulator (4) of the radio or base station (1) to form pre-equalized signals for transmission to the second radio station (2) over plural channels, as disclosed, for example, on page 11, lines 21 to 25, of appellant's specification. The modulator (4) also codes the data streams for the individual mobile radio stations (2) using a code generator (5), as described on page 6, lines 21 to 26, and page 7, lines 14 to 17, of the appellants' specification. These features are shown in fig. 2, as evidenced by the drawing figure reference numbers in parentheses.

According to step b) of claim 31 the pre-equalized signals are transmitted

over the plural channels (20, 25) from the first radio station (1), which is supported by the disclosure on page 2, lines 7 to 11; Page 6, lines 19 to 24, page 11, lines 21 to 24, of appellant's specification.

According to step c) of claim 31 the transmitted pre-equalized signals are received in the second radio station (2), as noted on page 6, lines 11 to 18; page 11, line 21 to 27; and page 12, lines 4 to 10.

According to step d) of claim 31 an estimate of the total impulse response of the radio channels (20, 25) is determined in the first radio station. In fact, received signals from the second radio station are demodulated in a demodulator and supplied to a channel estimator (11), in which the estimate of the total impulse response is made, which is supported by the disclosure at page 11, lines 12 to 21, of the appellant's originally filed specification and claimed without mentioning the channel estimator (11) in steps a) and d)

According to the last paragraph of claim 31 the pre-equalization of the radio signals is performed in the modulator (4) of the first radio station (step a, claim 31) according to an estimate of the total impulse response of the radio channels (20, 25). This is supported by page 11, lines 22 to 24, of appellant's specification. Thus equalization of signals can be dispensed with in the second e.g. mobile radio station, as explained on page 2, lines 7 to 22. This would be particularly important in a mobile phone system in which the second radio station must be compact.

B. Claim 33

To perform the estimate of the total impulse response of all radio channels the channel estimator 11 in the case of the preferred embodiment must have information regarding the channel impulse response. In order to derive this channel impulse information reference signals are transmitted from the antennas (60, 65) of the second radio station (2) over the plural radio channels (20, 25). According to the preferred embodiment of the method according to claim 33, the estimate of the total impulse response is derived from superimposed reference signals received in the base station (1) from the mobile station (2), as explained on page 2, lines 23 to 29, of the appellant's specification and in more detail on page 12, line 31, to page 13, line 5 of the appellant's specification; also see fig. 4 and description associated with it on page 15, line 26, to page 16, line 6, and the mathematical derivations on page 16 and following of appellant's specification.

C. Claim 34

According to claim 34 the reference signals received by the first radio station (1) are multiplied with corresponding coefficients (C_1, C_2) of signals depending on the respective channels (20, 25) to form the superimposed reference signals from which the total impulse response is obtained in the base station (1). Page 3, line 27 to page 4, line 6, and page 12, lines 12 to 19; page

12, line 31 to page 13, line 6; and of appellant's specification explain how the reference signals received by the first radio station (1) are formed by making a weighted linear combination with the corresponding coefficients and how the resulting superimposed reference signals are used for deriving the total impulse response in the channel estimator (11) of the first radio station (1).

D. Claims 32, 35 and 36

Also according to claim 32 signals received by the antennas (60, 65) of the second radio station (2), in the respective channels are multiplied by the corresponding channel-dependent coefficients (C_1, C_2) used for their transmission and then combined linearly and the resulting received signal is input to a demodulator (7) for demodulation (fig. 2).

Claims 35 and 36 claim preferred embodiments of the method comprising widening the data transmitted with different codes and transmitting to multiple radio stations (2, 3). Claim 35 additionally claims that the pre-equalization is performed according to all the different codes and all the multiple channels from all radio stations. These latter features of the invention are supported by the disclosures on page 4, lines 7 to 21, and page 8, line 23, to page 9, line 11, of appellant's specification.

2. Radio Station Claims 37 and 38

A. Mobile Station Claim 37

Radio station claims 37 and 38 comprise apparatus for performing the method claimed in claims 31 to 36. Figure 2 and the associated description on pages 6 to 13 of the appellant's specification provide a general basis for these claims, although figure 2 and this description only relate to a preferred embodiment of the mobile station claimed in claims 37 and the base station claimed in claim 38.

Claim 37 claims a mobile station (2) with at least two antennas (60,65), means for transmitting respective weighted reference signals to base station (1) via the at least two antennas (60, 65), means for multiplying signals received by the at least two antennas with respective weighting coefficients (C_1, C_2) to form weighted received signals, means for adding the weighted received signals to form a resulting linear combined signal and means for inputting the resulting linear combined signal to a first demodulator (7). This mobile station with these elements is shown in figure 2; the drawing reference numbers and letters in parenthesis appear on figure 2.

Claim 37 also includes a "wherein clause" defining the manner in which the weighted reference signals are formed by the mobile station 2. According to the "wherein clause" the weighted reference signals are formed by multiplying

respective reference signals by the corresponding coefficients (C_1, C_2) assigned to respective antennas (60, 65). Support for this feature is found on page 12, lines 12 to 19, of appellant's originally filed specification.

The at least two antennas (60, 65) recited in claim 37 for receiving and transmitting signals over corresponding plural radio channels (20, 25) are disclosed on page 6, lines 9 to 18, and shown in figure 2.

The "means for transmitting weighted reference signals" recited in claim 27 is a "means plus function" element under 35 U.S.C. 112, sixth paragraph,. This "means plus function" element comprises the third transceiver (40) and fourth transceiver (45) shown in figure 2, which comprise structure for performing the function of transmission of the signals from the second modulator (6) after weighting (multiplying with C_1, C_2 by means of multipliers which are indicated by the standard symbol -- a circle with an "X" inside of it -- next to and to the immediate right of the third and fourth transceivers in figure 2) with the respective weighting coefficients (C_1, C_2). See page 12, lines 12 to 19, of appellant's originally filed specification for support for this means for transmission feature.

The "means for multiplying corresponding received signals from the two antennas (60, 65) with the coefficients (C_1, C_2) to form weighted received signals" is a "means plus function" element under 35 U.S.C. 112, sixth paragraph, and is described in lines 7 to 12 of page 12 of appellant's specification and is shown in figure 2. This "means plus function" element comprises the multipliers and the transceivers (40, 45), which input received signals from the two antennas (60, 65) to the separate multipliers, which are shown in Fig. 2 with the standard

symbols -- a circle with an "X" inside of it -- below the two multipliers receiving reference signals from the second modulator (6) in figure 2.

Note that the same weighting coefficients (C_1, C_2) are used for weighting transmitted reference signals and received signals from the antennas, as shown at the bottom of figure 2. This is supported by the disclosure in lines 7 to 19 of the appellant's specification.

The "means for adding the weighted received signals" is also a means plus function element under 35 U.S.C. 112, sixth paragraph. The adder (80) shown in figure 2 comprises structure for performing the function of this means for adding.

The "means for inputting" only designates e.g. a cable or conductor between the adder (80) and the first demodulator (7). It is hardly a distinguishing feature of the invention and could be interpreted as a simple structural element or device, instead of a means plus function element under 35 U.S.C. 112, sixth paragraph. However in claim 37 it is a "means plus function" element, which performs the function of inputting the signal from the adder (80) to the demodulator (7).

B. Base Station Claim 38

Claims 38 claims a base station (1) comprising a modulator (4), which includes means for pre-equalization of radio signals to form pre-equalized signals; means for transmitting the pre-equalized signals over respective radio

channels (20,25) to a second (mobile) radio station with corresponding antennas (60, 65) and means for performing an estimate of a total impulse response of the plural radio channels (20, 25) from respective reference signals received over the radio channels for the second radio station. Furthermore claim 38 states that the means for pre-equalization performs the pre-equalization according to an estimate of the total impulse response of the plural radio channels.

The modulator (4) generally (but not mentioned in claim 38) expands signals for transmission with codes from code generator (5) as a function of particular mobile stations selected to receive transmissions (page 7, lines 14 to 17, page 6, line 25 and following) and also includes the means for signal pre-equalization that is recited in claim 38. The means for signal pre-equalization recited in claim 38 is a "means plus function" element under 35 U.S.C. 112, sixth paragraph. The structure for performing the pre-equalization function is part of the modulator (4) according to page 4, lines 10 to 15, and page 11, lines 15 and following of the appellant's specification.

The "means for performing the estimate of the total impulse response from received reference signals" is also a "means plus function" element under 35 U.S.C. 112, sixth paragraph. The structure for performing this function, namely estimating the total impulse response, comprises demodulator (75) for the received reference signals and channel estimator (11) shown in figure 2. This is supported by the disclosure on page 11, lines 15 to 24, and described mathematically on pages 19 to 21, especially page 21, lines 3 to 10.

The "means for transmitting the pre-equalized signals over plural radio

channels (20, 25)" is also a "means plus function" element under 35 U.S.C. 112, sixth paragraph. The structure for performing the transmission function comprises the transceiver (30) shown in figure 2. Basis for this structure is provided on page 11, lines 6 to 12.

3. Method Claims 39 to 45

None of the elements of the claimed method recited in independent method claim 39 or any of the dependent method claims 40 to 45 are in "step for form" and thus none of these claims contain "step plus function" elements, which must be interpreted in accordance with 35 U.S.C. 112, sixth paragraph.

Like method claim 31, the method claimed in independent method claim 39 is generally characterized by transmission of pre-equalized signals from a transmitter or base station (1) over a plurality of radio channels (20, 25) to a second or mobile radio station (2), which helps to reduce fading or amplitude fluctuations that can occur in a multi-way transmission channel in connection with other features of the invention. This subject matter is included in method claim 39, in the preamble and step b), and is summarized on page 1, line 14 to page 2, line 2, of the appellant's originally filed specification.

Claim 39, step a) claims pre-equalization of radio signals in the modulator (4) of a first radio station (1) or base station. This feature is disclosed on page 4, lines 10 to 15, and on page 14, lines 7 to 16, in connection with the embodiment of figure 3 and is in connection with the embodiment shown in figure 2, as

explained above. The remaining steps of the method claimed in claim 39 have basis for example on page 14, line 27 to page 15, line 34 as well as the description on pages 13 and 14 generally and on page 4, lines 7 to 21, of the originally filed specification of the appellant. The steps of transmitting other signals over additional channels from other radio stations (3) to the base station (1) and widening data transmitted from the different radio stations including the other radio stations with different codes as well as performing the pre-equalization according to all different codes and all transmission properties of all radio and additional channels (2, 3) is supported particularly by the disclosure on page 4, lines 7 to 21, and page 8, line 20, to page 9, line 11.

Claim 40 claims transmission of the pre-equalized signals from plural antennas (50, 55) of the first radio station (1) over a plurality of channels (20, 25), wherein the pre-equalization is performed according to the estimate of the impulse response. See figure 3 and the associated description, particularly page 13, lines 8 to 14, for the disclosure regarding plural antennas in the base station and page 13, last two lines to page 14, line 16, for basis for the steps in claim 40 regarding performance of the pre-equalization according to the impulse response determined for each channel.

Claim 41 is supported by the disclosure related to figure 3, which shows that there is a single antenna (60) in the mobile station (2).

Claim 42 claims an embodiment, in which the pre-equalized signals are transmitted over plural radio channels from the first radio station (1) to corresponding antennas (60, 65) of the second radio station (2), and received

signals by the antennas (60,65) are combined linearly and subsequently input to a demodulator (7). The source of these features in the disclosure has been explained above in connection with claims 31 and 32.

Claim 43 claims embodiments of the method in which respective reference signals are transmitted to the first radio station (1) over the plural radio channels and the estimate of the total impulse response is derived from these respective reference symbols. This claim is similar to claim 32 and support for this latter is described above.

Claim 44 is basically the same as claim 34 and support for this latter claim is described above.

Figure 4 and the disclosure regarding figure 4 on pages 15 and 16 provides basis for claim 45: the transmission properties of the radio channels are ascertained from data transmissions to the first radio station from the other radiation stations including the second radio station.

4. Radio Station Claims 29 and 30

A. Claim 29

Claim 29 claims a first radio station (base station 1), which includes the two antennas (50, 55) for transmitting pre-equalized signals, a code generator (5) for widening data transmitted with the pre-equalized signals with a respective code and a modulator (4) including means for pre-equalization. According to the

last paragraph of claim 29 the pre-equalization is performed in the modulator (4) according to all actually used codes and transmission properties of all radio channels (20, 25). This embodiment is illustrated generally in figure 3 of appellant's specification and described generally on page 13, line 6, to page 15, line 3, of appellant's specification.

The two antennas (50, 55) are not claim elements that must be interpreted according to the sixth paragraph of 35 U.S.C. 112 and this feature of claim 29 is supported by the disclosure in the specification on page 13, lines 6 to 14, and page 13, line 32, to page 14, about line 5.

The code generator (5) is a "means plus function" element under 35 U.S.C. 112, sixth paragraph. The function performed is of course the widening of data transmitted according to a selected radio link, as generally described on pages 6 and 7, especially page 6, lines 20 to 26, and page 7, lines 14 to 17, of appellant's specification. On the other hand, no special structural features of the code generator have been disclosed in the description of the preferred embodiments, primarily because the present invention does not concern the detailed structure of the code generator and because known code generators are available in the prior art.

The modulator (4) generally (but not mentioned in claim 29) expands signals for transmission with codes from the code generator (5) as a function of particular mobile stations selected to receive transmissions (page 7, lines 14 to 17, page 6, line 25 and following) and also includes the means for signal pre-equalization that is recited in claim 29. The means for signal pre-equalization

recited in claim 38 is a "means plus function" element under 35 U.S.C. 112, sixth paragraph. The structure for performing the pre-equalization function is advantageously part of the modulator (4) according to page 4, lines 10 to 15, of the appellant's specification. Like the details of the code generator, structural details of an equalizer circuit in the modulator are not disclosed.

The specification of the appellants on page 4, lines 10 to 15, and page 8, lines 23 to 30, support the feature in the last paragraph of claim 29, namely that the pre-equalization means in the modulator (4) performs the pre-equalization according to all actually used codes and transmission properties of the actually used radio channels (20, 25).

B. Claim 30

Dependent claim 30 claims embodiments of the radio station of claim 29 including channel estimators (11, 12) for determining an impulse response of each radio channel separately and pre-equalizing the transmitted signals in modulator (4) of the base station (1) according to the impulse response of each radio channels. Basis for this feature is provided in the last two lines of page 13 and lines 1 to 16 of page 14 of the appellant's specification and in figure 3.

Claim 30 does include a "means plus function" element. In this case the function is "determining an estimate of an impulse response of each radio channel".

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

(1) Whether or not radio station claims 29 and 30 and method claims 39, 40 and 45 are anticipated under **35 U.S.C. 102 (e)** by Antonio, et al, U.S. Patent 6,519,456 B2.

(2) Whether or not method claims 31, 32, 35 and 42 are obvious under **35 U.S.C. 103** over Antonio, et al, in view of Karlsson, U.S. Patent 6,167,039.

(3) Whether or not method claims 33, 34, 36, 43 and 44 and radio station claims 37 and 38 are obvious under **35 U.S.C. 103** over Antonio, et al, U.S. Patent 6,519,456 B2, in view of Karlsson, et al, U.S. Patent 6,167,039, and further in view of Zhuang, et al (Vehicular Technology Conference, 1995 IEEE 45th Volume: 1, 25 to 28, July 1995 Pages: 206 to 210, Vol. 1).

(4) Whether or not claim 41 is obvious under **35 U.S.C. 103** over Antonio, et al, in view of Zhuang, et al.

VII. ARGUMENT

1. Anticipation Rejection based on Antonio, et al

The first issue is whether or not radio station claims 29 and 30 and method claims 39, 40 and 45 are anticipated under **35 U.S.C. 102 (e)** by Antonio, et al, U.S. Patent 6,519,456 B2 (referred to below as "Antonio"). Appellants respectfully submit that these claims claim subject matter that includes at least one critical difference from that of Antonio, et al.

In the softer handoff method of Antonio as claimed in claim 1 an improved softer handoff of telephone calls between sectors of **a** base station during a connection with **a single** mobile subscriber may be employed to decrease the number of calls dropped by the base station. Each of the individual sectors of a base is in effect acting as a separate base station according to column 2, lines 32 to 34, of Antonio.

In appellant's method the "plural channels" of claims 29 and 39 are both forward channels for transmission of exactly the same pre-equalized signals with the same data for reception by a single mobile station during an entire data transmission, not merely during softer handoff. Page 10, line 12, to page 11, line 2, of appellant's specification explains the advantages of using at least two forward channels for simultaneous transmission of message data and signals between a single base station and a mobile station in a CDMA cellular system.

Interference (ISI) and amplitude incursions, which would otherwise lead to gaps in the reception of the signals, by the single mobile station are thus avoided.

The advisory action responds to the above-type of argumentation regarding two forward channels by observing that each sector of the base station can have a directional antenna (column 5, lines 20 to 24, of Antonio) and that it is well-known that phased array antennas are used in a base station to provide directionality. The particular type of antenna used in each sector is hardly relevant to the arguments presented here or at least it is not immediately apparent how the antenna type is relevant.

The advisory action continues by stating that Antonio does teach that the modulator 114 in one sector shown fig. 5 may have a plurality of channels and can process signals in the plural channels according to Antonio at column 10, lines 28 to 31. But the Antonio reference clearly states that these different channels are CDMA channels. However by definition a CDMA channel is a channel that is characterized by a different code for each different mobile station. Thus the reference at this point in column 10 is merely teaching that the base station transmits signals from the modulator 114 in each sector to plural mobile stations via respective CDMA channels, as shown for example in figure 1 of Antonio.

No where in the disclosure of Antonio does the reference explicitly state or suggest that signals produced in a **single** modulator of one sector are transmitted from the base station over **plural** channels and are received in **one and the same** mobile station, as claimed in claim 29 and in claim 39.

A. Method Claim 39

In contrast, step a) to c) of claim 39 are as follows:

"a) performing a pre-equalization of radio signals to be transmitted in ***said modulator* (4)** of said first radio station in order to form **pre-*equalized signals***;
b) transmitting ***said pre-equalized signals*** from the first radio station (1) ***over each of*** a plurality of radio channels (20, 25) to the second radio station (2);
c) receiving ***said pre-equalized signals*** transmitted over ***each*** of said radio channels (20, 25) in the second radio station;" [emphasis ours]

It would be absurd to suggest that the Antonio reference teaches a method including these steps; it does not teach a base station that transmits signals produced in a **single** modulator to a single second radio station over each of plural radio channels at the same time.

The disclosure of the presence of several CDMA channels and simultaneous transmissions over them is not the same as disclosing that signals are transmitted from a single modulator of a single base station over each of the plural channels to a single mobile station, which receives the signals transmitted over both channels. If the channels are CDMA channels by definition there are plural mobile stations as shown in Figure 1 of Antonio, each of which receives signals from the base state over a single CDMA channel, as shown in Fig. 1 of Antonio.

In the method of softer handoff between sectors of a single base station disclosed in Antonio a single mobile phone (radio station 2) receives signals from the base station 1 first via one channel in a first sector in a CDMA cellular system, but then (perhaps because of travel of the user with the phone) receives signals from another channel in the e.g. second sector of the base station, but of course is later disconnected from the channel in the first sector.

The purpose of the simultaneous transmissions over the two channels in the different sectors of the single base station to the mobile radio station in the method of Antonio is to provide an uninterrupted data or signal transmission from the base station to the mobile radio station and the base station, in spite of the fact that the mobile radio station is moving from one sector to the other. However the plural forward communication channels are set up only during the transitory period during which handoff takes place. In contrast, in the case of appellant's method the plural forward channels set up for signal or data transmissions from the base station to the mobile station remain active during an entire data or message transmission from the base station to the mobile station in order minimize ISI and MAI interference as explained on page 7, line 18 and following in appellant's originally filed specification.

The difference between the purpose of Antonio and that of appellant is reflected by differences between the method claimed in appellant's claim 39 (steps a) to c) listed above) and the method disclosed in Antonio. According to appellant's claim 39 pre-equalized radio signals are produced in **a single modulator** 4 containing data for transmission *and* the (i.e. the same) pre-

equalized signals are transmitted over each of the plural channels to the second radio station 2 *and* the pre-equalized signals are received in the second radio station. In contrast during the softer handoff method of Antonio one modulator produces the signals in one channel of one sector during a softer handoff, while another different modulator produces the signals for another channel of another sector during the softer handoff. Figure 5 of Antonio shows that each sector of a single base station has its own modulator 114. Thus the method of Antonio is not the same as the method claimed in claim 39, in which the pre-equalized signals transmitted over the plural channels from the base station are the same and produced by one and the same modulator. For example, there will always be small tolerance differences between different modulators.

B. Base Station Claim 29

Similarly appellant's claim 29 claims a radio station or base station 1 including **a** (single) modulator 4 that produces **the** pre-equalized signals (third paragraph of claim 29) that are transmitted from at least two antennas 50, 55 over the respective radio channels (20, 25) (first paragraph of claim 29).

Furthermore Antonio states that the individual sectors of a base station are in effect individual base stations or separate cell sites -- probably because they cover different geographic areas (column 2, line 32 to 34). Because of this each sector of a multi-sector base station has all the components necessary to act as a base station and each sector has a different modulator, while in contrast

the "radio station" according to claim 29 has only a single modulator, which produces pre-equalized signals for each of plural channels.

C. Both Claims 29 and 39

The following arguments to overturn the anticipation rejection are based on features that are common to both claims 29 and 39.

Furthermore Antonio only discloses that the modulator 114 can perform the function of "adaptive pre-distortion" (column 10, lines 54, 55) and "phase pre-equalization" (column 12, line 16). This reference does not disclose the feature of the pending claims 29 and 39 that the transmission properties of all actually used channels are considered during the pre-equalization (claim 29, 39). However these features are at the heart of the invention now claimed in these claims. This means that when plural radio channels are used to transmit signals from a single modulator of e.g. a base station to a single mobile radio station, the claimed method of the appellant considers the transmission properties all the plural radio channels during the production of the pre-equalized signals in the modulator.

Thus the use of plural radio channels for transmission from the first radio station to the second radio station not only provides transmission diversity operation, which improves the reception in the second radio station. Additionally the transmission diversity operation is considered in the pre-equalization so that distortion of the received signals in the second radio station can be prevented by transmission over plural radio channels from the first radio station to the second

radio station. This reduces work performed in the second radio station.

In fact in the rebuttal arguments on paragraph 2 of the final Office Action what is "well known" in the art regarding IIR filters is relied on to establish anticipation of the pre-equalization features of claim 29 and 39 based on Antonio. No citation to a particular location of these disclosures in Antonio is provided in these arguments. Furthermore other references, such as Zhuang, are mentioned in connection with the anticipation. A single prior art reference with all the features of claims 29 and 39 should be cited as a basis for this anticipation rejection, or the rejection should be overturned.

Thus the reference Antonio itself hints at some sort of pre-equalization but does not disclose or suggest a pre-equalization with the advantageous features and benefits of the appellant's claimed radio station and method.

It is well established that *each and every limitation* of a claimed invention must be disclosed in a *single* prior art reference in order to be able to reject the claimed invention under 35 U.S.C. 102 (b) based on the disclosures in the *single* prior art reference. See M.P.E.P. 2131 and also the opinion in ***In re Bond***, 15 U.S.P.Q. 2nd 1566 (Fed. Cir. 1990).

First, Antonio does not disclose or suggest a pre-equalization with the advantageous features and benefits of the appellant's claimed radio station and method, as explained above. Second, Antonio, does not disclose or suggest that pre-equalized radio signals are produced in **a single modulator** 4 containing data for transmission *and* the (i.e. the same) pre-equalized signals are transmitted over each of the plural channels to the second radio station 2 *and* the

pre-equalized signals are received in the second radio station, as claimed in appellant's claim 39 and similarly regarding claim 29.

For the foregoing reasons Honorable Board of Patent Appeals and Interferences is respectfully requested to overturn the rejection of radio station claims 29 and 30 and of method claims 39, 40 and 45 as anticipated under **35 U.S.C. 102 (e)** by Antonio, et al, U.S. Patent 6,519,456 B2.

2. Obviousness Rejection of Method Claims 31, 32, 35 and 42

Claims 31 to 32, 35 and 42 stand rejected under 35 U.S.C. 103 (a) as obvious over Antonio, et al, U.S. Patent 6,519,456 B2, in view of Karlsson, et al, U.S. Patent 6,167,039 (referred to as "Karlsson" hereinbelow).

A. Main Method Claim 31

Method claim 31 includes the same distinguishing features in steps a to c that claim 39 does. Specifically in the case of method claim 31 the first three steps of the claimed method are:

> "a) performing a pre-equalization of radio signals to be transmitted in **said modulator** (4) of said first radio station in order to form **pre-equalized signals**;
> b) transmitting **said pre-equalized signals** from the first radio station (1) over **each of** a plurality of radio channels (20, 25) to the second radio station (2);

c) receiving **said pre-equalized signals** transmitted over **each of** said radio channels (20,25) in the second radio station ..."

In the method of softer handoff between sectors of a single base station disclosed in Antonio a single mobile phone (radio station 2) receives signals from the base station 1 first via one channel in a first sector in a CDMA cellular system, but then (perhaps because of travel of the user with the phone) receives signals from another channel in the e.g. second sector of the base station, but of course is later disconnected from the channel in the first sector.

The purpose of the simultaneous transmissions over the two channels in the different sectors of the single base station to the mobile radio station in the method of Antonio is to provide an uninterrupted data or signal transmission from the base station to the mobile radio station and the base station, in spite of the fact that the mobile radio station is moving from one sector to the other. However the plural forward communication channels are set up only during the transitory period during which handoff takes place. In contrast, in the case of appellant's method the plural forward channels set up for signal or data transmissions from the base station to the mobile station remain active during an entire data or message transmission from the base station to the mobile station in order minimize ISI and MAI interference as explained on page 7, line 18 and following in appellant's originally filed specification.

The difference between the purpose of Antonio and that of appellants is reflected by differences between the method claimed in appellant's claim 31 (steps a) to c) listed above) and the method disclosed in Antonio. According

appellant's claim 31 pre-equalized radio signals are produced in **a single modulator** 4 containing data for transmission *and* the (i.e. the same) pre-equalized signals are transmitted over each of the plural channels to the second radio station 2 *and* the pre-equalized signals are received in the second radio station. In contrast during the softer handoff method of Antonio one modulator produces the signals in one channel of one sector during a softer handoff, while another different modulator produces the signals for another channel of another sector during the softer handoff. Figure 5 of Antonio shows that each sector of a single base station has its own modulator 114. Thus the method of Antonio is not the same as the method claimed in claim 39, in which the pre-equalized signals transmitted over the plural channels from the base station are the same and produced by one and the same modulator. For example, there will always be small tolerance differences between different modulators.

Furthermore Antonio only discloses that the modulator 114 can perform the function of "adaptive pre-distortion" (column 10, lines 54, 55) and "phase pre-equalization" (column 12, line 16). This reference does not disclose the feature of the pending method claim 31, that the pre-equalization is performed according to an estimation of the total impulse response of ***all*** radio channels used (claim 31). However these features are at the heart of the invention now claimed in the rejected claims. This means that when plural radio channels are used to transmit signals from a single modulator of e.g. a base station to a single mobile radio station, the claimed method of the appellant considers an estimate of the total impulse response of all radio channels.

Thus the use of plural radio channels for transmission from the first radio station to the second radio station not only provides transmission diversity operation, which improves the reception in the second radio station. Additionally the transmission diversity operation is considered in the pre-equalization so that distortion of the received signals in the second radio station can be prevented by transmission over plural radio channels from the first radio station to the second radio station. This reduces worked performed in the second radio station.

In fact in the rebuttal arguments on paragraph 2 of the final Office Action what is "well known" in the art regarding IIR filters is relied on to establish anticipation of the pre-equalization features of claim 29 and 39 based on Antonio. No citation to a particular location of these disclosures in Antonio is provided in these arguments. Furthermore other references, such as Zhuang, are mentioned in connection with the anticipation.

Thus the reference Antonio itself hints at some sort of pre-equalization but does not disclose or suggest a pre-equalization with the advantageous features and benefits of the appellant's claimed radio station and method.

Karlsson does disclose a mobile radio receiver with plural antennas and plural signal processing systems connected with the respective antennas, in order to receive radio stations from different base stations in different locations (claim 1, and column 4, lines 4 to 20). Particularly this reference discloses explicit techniques for suppressing interference from competing base stations without knowledge of the spreading sequence of the interfering base stations (column 4, lines 9 to 16).

However as admitted on page 4 of the Office Action, Karlsson does not even disclose transmitting signals from a single base station to a single mobile station via plural radio channels, so that Karlsson **could not** disclose or suggest the key distinguishing features of claim 31 above or modification of the disclosures in Antonio that are necessary to arrive at the subject matter of claim 31. Karlsson was cited for different reasons.

More specifically Karlsson does **not** suggest that the pre-equalization is performed according to an estimation of the total impulse response of ***all*** radio channels used (see step d and paragraph below it of claim 31) because there is always only one channel connecting the mobile radio station with a base station or one channel for each base station according to Karlsson. Also Karlsson does **not** suggest that the pre-equalized signals are produced in a single modulator 4 and then transmitted over each of at least two channels to a receiver, in which they are received.

Thus a combination of Antonio and Karlsson does **not** suggest the subject matter of claim 31 because the modifications of the disclosures in these references that are necessary to obtain the claimed subject matter are not suggested. Simply stated, one skilled in the art would not find a suggestion of the key distinguishing features of claim 31 in either reference.

Furthermore the mere fact that the combined subject matter of Antonio and Karlsson could be modified to arrive at the method as claimed in claim 31 is insufficient to provide a basis for a rejection under 35 U.S.C. 103 (a). The purposes and objects of the invention of the appellant are different from those of

the inventions disclosed in both these references. Thus the desirability of the modifications of the combined subject matter of these references would not be apparent to one skilled in the art. For example, the Federal Circuit Court of Appeals has said:

> "The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification... It is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has previously stated that "one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." ***In re Fritch***, 23 U.S.P.Q. 2nd 1780, 1783-84 (Fed. Cir. 1992).

The differences between the combined subject matter of Antonio and Karlsson and claim 31 would only be suggested to one of ordinary skill in the art upon reading the disclosures in the appellant's specification, which would amount to an impermissible use of hindsight and appellant's disclosure under 35 U.S.C. 103 (a).

B. Claims 32 and 35

Claims 32 and 35 are dependent on claim 31 and thus are not obvious from Antonio and Karlsson for that reason. In other words, the features of claim 31 are relied to overcome the rejection of claims 32 and 35. Essentially claims 32 and 35 are not argued separately here from claim 31.

C. Claim 42

Claim 42 depends on independent method claim 39, but the combined subject matter of claims 42 and 39 is substantially the same as the combined subject matter of independent method claims 31, 32 and 35. Thus the differences that distinguish claim 31 from the combination of the disclosures of Antonio and Karlsson would also distinguish claim 42 from those same references. Thus the arguments for overturning the obviousness rejection of claim 31 are relied on here for overturning the obviousness rejection of claim 42 and are included in this section by reference.

For the foregoing reasons Honorable Board of Patent Appeals and Interferences is respectfully requested to overturn the rejection of claims 31 to 32, 35 and 42 under 35 U.S.C. 103 (a) as obvious over Antonio, et al, U.S. Patent 6,519,456 B2, in view of Karlsson, et al, U.S. Patent 6,167,039.

3. Obviousness Rejection of Claims 33 to 34, 36 to 38 and 43 to 44

Radio station claims 37 and 38 and dependent method claims 33 to 34, 36 and 43 to 44 stand rejected under 35 U.S.C. 103 (a) as obvious over Antonio, et al, U.S. Patent 6,519,456 B2, in view of Karlsson, et al, U.S. Patent 6,167,039,

and further in view of Zhuang, et al (Vehicular Technology Conference, 1995 IEEE 45th Volume: 1, 25 to 28, July 1995 Pages: 206 to 210, Vol. 1) (referred to as Zhuang hereinbelow).

A. Claim 37

Radio station claim 37 claims the structure of the mobile radio station 2.

Note that the radio station of claim 37 includes

"means for ***multiplying*** corresponding ***received*** signals from said at least two antennas with ***said respective coefficients*** (c1, c2) to form weighted received signals" which are combined linearly and fed to a demodulator, and also

"means for ***transmitting*** respective weighted reference signals to said another radio station (1) from said at least two antennas over said corresponding radio channels (20,25), wherein ***said respective weighted reference signals*** are formed by ***multiplying*** respective reference signals by ***corresponding coefficients*** assigned to said at least two antennas..."

Antonio only discloses the structure of a base station 1 and thus is not particularly relevant to claim 37.

Karlsson does not teach or suggest that reference signals are transmitted from the radio station 2 (mobile station) to a base station 1 and that the reference signals are weighted multiplicatively with associated coefficients assigned to the antennas in the mobile station 2 --- in order to provide a basis for deriving the estimate of the total impulse response so that the modulator in the base station

can generate the pre-equalized signals. The multiple antennas and signal processing circuitry in the radio station of Karlsson are for the purpose of suppressing interference of signals received from plural base stations (column 4, lines 9 to 16).

Especially Karlsson does not suggest that the signals ***received*** over the plural radio channels by the plural antennas of the radio station of claim 37 are weighted with the **same** coefficients in the receiving station that were used by the means for transmitting to weight the reference signals transmitted back to the base station. Karlsson not only does not teach that the base station receives reference signals ***transmitted*** from the radio station of claim 37, which are weighted multiplicatively with associated coefficients for each radio channel, but also does not disclose that the signals ***received*** over the radio channels by the radio station of claim 37 are weighted with the same coefficients in the receiving station.

These features, which are present in the pending claim 37 and missing in the Karlsson and Antonio references, provide an important advantage because a directional action or characteristic of the signals received or propagated by the antenna of the base station is obtained. Because of the weighting of the reference signals transmitted from the radio station it can be guaranteed that during pre-equalization of the signals transmitted from the second radio station to the receiving station, all radio channels between both radio stations will be considered, also the described directional action is taken into account. The attainment of this sort of directional interaction between the antennas of both

radio stations communicating with each other is not obvious from any of the cited references.

The assertion in the Office Action that the weighting process is also used for the transmitted signals in the case of Karlsson because of bidirectionality of the communication channel between the mobile station and the base station is without basis. Also Karlsson does not provide any hint or suggestion so that one skilled in the art could arrive at this feature.

Finally the weighting of the received signals in the method disclosed in Karlsson is for the purpose of suppressing interference in the receiver. The transmission of the weighted signals, which are produced for suppressing interference in the receiver of Karlsson, from the radio station of Karlsson is not disclosed in the reference and would be completely superfluous. It would have hardly any effect or result so that it is not understood why the additional work for weighting the signals to be transmitted would be performed in the mobile station of Karlsson.

Zhuang does not explicitly disclose that reference signals multiplied by weighting factors are transmitted.

Furthermore, the combination of the disclosures of Karlsson and Zhuang in the manner suggested in Office Action to obtain the claimed invention according to claim 37 is not permissible, because they describe entirely different methods for interference suppression. While the reference Karlsson suppresses intersymbol interference (ISI) because it suitably weights received signals from several antennae, the Zhuang reference suppresses such intersymbol

interference (ISI) because the channel impulse response is estimated in the receiver. The estimation of channel impulse response according to Zhuang and the weighting of the signals received by several antennas according to Karlsson are completely different methods for suppression of interference in a receiver.

Thus in order to combine Zhuang with Karlsson to obtain the claimed invention the methods according to Karlsson must be modified in a manner such that its basic principle of operation is changed. This sort of combination is not permitted under 35 U.S.C. 103 (a) according to MPEP 2143.02 and judicial decisions cited therein. The proposed modification of Karlsson considering the disclosures of Zhuang would modify a basic principle of operation of Karlsson, i.e. one must replace the method of suppressing ISI in Karlsson with that of Zhuang.

The position taken in the Office Action regarding Zhuang concerns the reduction of ISI for the "reverse link" from the mobile station to the base station. That means that the base station receives a signal with interference from the mobile station and suppresses the interference according to the estimation of the channel impulse response. However in contrast to the opinion in the Office Action and the citations there Zhuang does not disclose that the base station receives a reference signal transmitted at the mobile station. Only the reception direction is considered in Zhuang at the place cited, just like in Karlsson. For this purpose a reference signal can be received by the base station, which however is not disclosed in reference Zhuang. Zhuang does not disclose the feature involving transmission of the reference signals as claimed in claim 37.

Thus the pending claim 37 is not obvious from a combination of the references Antonio, Karlsson and Zhuang.

B. Claim 38

Base station claim 38 includes the distinguishing features described above, namely that the base station contains a **single** modulator including means for pre-equalization to form pre-equalized signals sent over plural radio channels and that the base station includes means for performing **an estimate of the total impulse response of all of the radio channels** and that the **modulator** including the means for pre-equalization **performs** the **pre-equalization** according to the estimate of the total impulse response of all of the radio channels or the plural radio channels.

Regarding the argumentation regarding claim 38 on page 20 of the final Office Action, Zhuang, section II, lines 5 to 9, is cited for disclosing **one** of the features of pending base station claim 38, namely that an estimation of the impulse response of the radio channel depends on respective reference signals, which are received from the second radio station or mobile station over plural radio channels. At this cited location in Zhuang the Office Action continues by stating that the reduction of the ISI in reception in the base station is based on the estimate of the channel impulse response.

However in contrast to the opinion on page 20 of the Office Action Zhuang does ***not*** disclose that pre-equalization takes place according to an estimate of

the ***total*** impulse response of ***all*** radio channels or ***plural*** radio channels connected the base station with the mobile radio station, as required by claim 38. Zhuang does ***not*** disclose ***anything*** regarding multiple forward channels connecting a transmitter and receiver.

The estimate of the channel impulse response described in Zhuang serves for pre-equalization of the data received by the base station and not pre-equalization of the data to be sent from it, in contrast to the subject matter of the pending claim 38 (paragraph 2 of claim 38 .. "means for transmitting pre-equalized..."). Thus Zhuang cannot be combined with Antonio, in which a combined pre-equalization takes place.

Furthermore as noted above Zhuang, which is used by the Examiner regarding claim 38 for reception by means of several antennas, may not be combined with Karlsson for the reasons described for claim 37. The reason is because Zhuang relates to an entirely different concept for suppression of ISI without use of weighting factors in contrast to that used in Karlsson.

Thus claim 38 is not obvious from a combination of Antonio, Karlsson and Zhuang.

C. Dependent Method Claims 33, 34, 35, 36, 43, 44

These claims generally limit the independent claims to a method in which reference signals are transmitted over the reverse link from the mobile station 2 to the base station 1. Thus the argumentation used to overcome the rejection of

mobile station claim 37 applies here as well as the argumentation for allowance of the independent claim on which they depend.

Zhuang does not provide the necessary hint or suggestion of the modifications of the subject matter of the independent method claims that are necessary to arrive at the inventive methods claimed in them. In other words, Zhuang does not supply what is lacking e.g. in Antonio, to reject claim 39 and the claims dependent on it as obvious.

Furthermore Karlsson is not combinable with Zhuang in the manner suggested in the Office Action for the reasons summarized in connection with claims 37 and 38.

For the foregoing reasons Honorable Board of Patent Appeals and Interferences is respectfully requested to overturn the rejection of claims 33 to 34, 36 to 38 and 43 to 44 under 35 U.S.C. 103 (a) as obvious over Antonio, et al, U.S. Patent 6,519,456 B2, in view of Karlsson, et al, U.S. Patent 6,167,039, and further in view of Zhuang, et al (Vehicular Technology Conference, 1995 IEEE 45th Volume: 1, 25 to 28, July 1995 Pages: 206 to 210, Vol. 1).

4. Obviousness Rejection of Method Claim 41

Claim 41 stands rejected as obvious over Antonio, et al, U.S. Patent 6,519,456 B2, in view of Zhuang, et al (Vehicular Technology Conference, 1995 IEEE 45th Volume: 1, 25 to 28, July 1995 Pages: 206 to 210, Vol. 1).

Method claim 41 depends on claims 40 and 39, which were rejected as anticipated by Antonio. Method claim 41 claims embodiments of the method according to a combination of claims 39 and 40 in which the respective reference signals are transmitted over a reverse link to the base station from the mobile station.

However the secondary reference, Zhuang, does not disclose the feature related to transmission of the reference signals to the base station, at least at the cited locations in the Office Action.

Furthermore Zhuang does not disclose or suggest a critical feature of claim 39 that is lacking or absent from the subject matter of Antonio. The Office Action asserts that Antonio discloses the feature "transmitting set pre-equalized signals from the first radio station over each of the plural radio channels (20, 25) to the second radio station". As previously mentioned it is indeed correct that the CDMA system described in Antonio performs a soft handoff, in which the mobile station simultaneously receives signals from more than one channel from different sectors of one and the same base station. However according to Antonio and in contrast to the subject matter of claim 39 these signals are **not** produced by a single modulator or single means for pre-equalization for all signals, but instead by a separate different modulator 114 in each different sector of a base station (see Fig. 5 of Antonio and locations cited above regarding the anticipation rejection).

Not only that, Antonio does not disclose the feature in the last paragraph of the pending claim 39, which indicates that the pre-equalization is performed in

the single modulator of the first radio station according to all different codes and depending on the transmission properties of all radio channels and the additional channels, but Zhuang also does not suggest this feature.

Furthermore Zhuang, which does not disclose a method of transmission **over plural channels** between a mobile station and a base station, certainly does not disclose or suggest pre-equalization performed in a **single** modulator of the base station according to **all** different **codes** and transmission properties of all of the plural radio channels, according to claim 39. The reason is simply that Zhuang does not disclose any plural radio channels so that pre-equalization of plural radio channels cannot be disclosed in that reference.

Thus Antonio cannot be combined with Zhuang under 35 U.S.C. 103 (a) to reject claim 39 as obvious and the same is true of claim 41, which depends on claim 39.

For the foregoing reasons Honorable Board of Patent Appeals and Interferences is respectfully requested to overturn the rejection of claim 41 under 35 U.S.C. 103 (a) as obvious over Antonio, et al, U.S. Patent 6,519,456 B2, in view of Zhuang, et al (Vehicular Technology Conference, 1995 IEEE 45th Volume: 1, 25 to 28, July 1995 Pages: 206 to 210, Vol. 1).

VIII. APPENDIX OF CLAIMS ON APPEAL

The following is a clean copy of the pending claims on appeal:

29. A radio station (1) comprising

at least two antennas (50,55) from which pre-equalized signals are propagated over respective radio channels (20,25) to an additional radio station (2);

a code generator (5) for widening data transmitted with the pre-equalized signals with a respective code, said code generator ascertaining said respective code according to a selected radio link; and

a modulator (4) including means for pre-equalization of radio signals to be transmitted to form the pre-equalized signals;

wherein said means for pre-equalization of said radio signals to be transmitted from said at least two antennas (50, 55) performs said pre-equalization according to all actually used codes and transmission properties of all actually used ones of said radio channels (20,25).

30. The radio station as defined in claim 29, further comprising at least one channel estimator (11, 12), and wherein said at least one channel estimator comprises means for determining an estimate of an impulse response of each of said radio channels (20, 25) and said pre-equalization of said radio signals to be

transmitted from said at least two antennas occurs according to said estimate of said impulse response for each of said radio channels.

31. A method for transmitting signals between a first radio station (1) and a second radio station (2), said second radio station having a plurality of antennas (60, 65) and said first radio station (1) including a modulator (4) with pre-equalization means, said method comprising the steps of:

a) performing a pre-equalization of radio signals to be transmitted in said modulator (4) of said first radio station in order to form pre-equalized signals;

b) transmitting said pre-equalized signals from the first radio station (1) over each of a plurality of radio channels (20, 25) to the second radio station (2);

c) receiving said pre-equalized signals transmitted over each of said radio channels (20,25) in the second radio station, said pre-equalized signals transmitted over respective channels being received in said second radio station (2) by corresponding antennas of the second radio station; and

d) determining an estimate of a total impulse response of all of said radio channels (20,25) in said first radio station (1);

wherein said pre-equalization of said radio signals is performed by said modulator (4) according to said estimate of said total impulse response determined in step d).

32. The method as defined in claim 31, wherein received signals received by said antennas (60, 65) of said second radio station (2) are combined linearly and subsequently input to a demodulator for demodulation.

33. The method as defined in claim 32, further comprising transmitting respective reference signals from said antennas (60,65) of said second radio station (2) over said radio channels (20,25) to said first radio station (1) and wherein said estimate of said total impulse response is derived from superimposed reference signals received in said first radio station (1).

34. The method as defined in claim 33, wherein said respective reference signals are multiplied with corresponding coefficients depending on which of said radio channels (20,25) is employed in transmitting said reference signals and said superimposed reference signals received in said first radio station are multiplied with said corresponding coefficients of said radio channels employed for transmitting said reference signals.

35. The method as defined in claim 31, further comprising transmitting additional radio signals to said first radio station (1) from additional radio stations (3), and wherein data transmitted with said additional radio signals from said additional radio stations are widened with different codes and said pre-equalization is performed in said modulator (4) of said first radio station (1) according to all of said different codes and transmission properties of all of said radio channels.

36. The method as defined in claim 35, wherein said transmission properties of said radio channels are determined from said data transmitted to the first radio station (1) from said additional radio stations (3) and from additional data transmitted to the first radio station (1) from the second radio station (2).

37. A radio station (2) comprising

at least two antennas (60,65) for receiving and transmitting radio signals transmitted over corresponding radio channels (20,25) from another radio station (1);

means for transmitting respective weighted reference signals to said another radio station (1) from said at least two antennas (60,65) over said corresponding radio channels (20,25), wherein said respective weighted reference signals are formed by multiplying respective reference signals by corresponding coefficients assigned to said at least two antennas, and so that said respective weighted reference signals are transmitted from corresponding antennas associated with said respective coefficients;

means for multiplying corresponding received signals from said at least two antennas with said respective coefficients (c1, c2) to form weighted received signals;

means for adding said weighted received signals to form a resulting linear combination; and

means for inputting said resulting linear combination to a demodulator.

38. A radio station (1) comprising

a modulator (4) comprising means for pre-equalization of radio signals to be transmitted to a second radio station (2) so as to form pre-equalized signals;

means for transmitting said pre-equalized signals over each of a plurality of radio channels (20,25) to said second radio station (2), said second radio station having a plurality of antennas (60,65) corresponding to said plurality of said radio channels; and

means for performing an estimate of a total impulse response of said plurality of said radio channels (20,25) from respective reference signals received over said radio channels from said second radio station;

wherein said means for pre-equalization performs said pre-equalization according to said estimate of said total impulse response of said plurality of said radio channels.

39. A method for transmitting signals between a first radio station (1) and a second radio station (2), said first radio station comprising a modulator (4) with means for pre-equalization, said method comprising the steps of:

a) performing a pre-equalization of radio signals to be transmitted in said modulator (4) of said first radio station in order to form pre-equalized signals;

b) transmitting said pre-equalized signals from the first radio station (1) over each of a plurality of radio channels (20, 25) to the second radio station (2);

c) receiving said pre-equalized signals transmitted over each of said radio channels (20, 25) in the second radio station;

d) transmitting other signals over additional channels from other radio stations (3) to the first radio station (1); and

e) widening data transmitted from different radio stations including the other radio stations with different codes;

wherein said pre-equalization in said modulator (4) of said first radio station is performed according to all of said different codes and according to transmission properties of all of said radio channels and said additional channels.

40. The method as defined in claim 39, further comprising performing an estimate of an impulse response of said radio channels (20, 25) in said first radio station (1), and wherein said pre-equalized signals are propagated from plural antennas (50,55) of the first radio station (1) and transmitted over said plurality of said radio channels (20,25) to the second radio station (2), and said pre-equalization of said signals propagated from said plural antennas (50,55) is performed according to said estimate of said impulse response.

41. The method as defined in claim 40, wherein a respective reference signal is transmitted to said first radio station (1) from a corresponding antenna (60) of said second radio station (2) over said plurality of said radio channels (20,25) and said estimate of said impulse response of said plurality of said radio

channels (20,25) is derived from said respective reference signal transmitted over said radio channels (20,25) to said first radio station.

42. The method as defined in claim 39, further comprising performing an estimate of an impulse response of each of said radio channels (20, 25) in said first radio station (1), and wherein said pre-equalized signals propagated by the first radio station (1) are transmitted over said plurality of said radio channels (20,25) and received by corresponding antennas (60,65) of said second radio station (2), said pre-equalization of said signals propagated by said first radio station (1) is performed according to said estimate of said total impulse response, and received signals received by said corresponding antennas (60,65) of said second radio station (2) are combined linearly and subsequently input to a demodulator.

43. The method as defined in claim 42, wherein respective reference signals are transmitted to the first radio station (1) over said plurality of said radio channels (20, 25) and said estimate of said total impulse response is derived from said respective reference signals in said first radio station (1).

44. The method as defined in claim 43, wherein said respective reference signals are multiplied by corresponding coefficients according to which of said radio channels is used for transmission of said respective reference signals and wherein said received signals received by said corresponding antennas (60, 65)

of said second radio station (2) are multiplied by said corresponding coefficients and then linearly combined with each other.

45. The method as defined in claim 39, wherein said transmission properties of said radio channels and said additional channels are ascertained from data transmissions of the second radio station (2) and the additional radio stations (2) to the first radio station.

IX. EVIDENCE APPENDIX

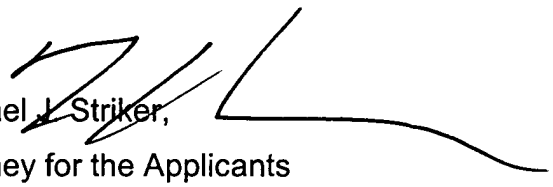
None

X. RELATED PROCEEDINGS APPENDIX

None

In view of the foregoing, favorable allowance is respectfully solicited.

Respectfully submitted,



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